



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
[www.uspto.gov](http://www.uspto.gov)

| APPLICATION NO.                  | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|----------------------------------|-------------|----------------------|---------------------|------------------|
| 10/666,482                       | 09/18/2003  | Koji Yamada          | 96790P442           | 8860             |
| 8791                             | 7590        | 05/13/2005           | EXAMINER            |                  |
| BLAKELY SOKOLOFF TAYLOR & ZAFMAN |             |                      | CHIEM, DINH D       |                  |
| 12400 WILSHIRE BOULEVARD         |             |                      |                     |                  |
| SEVENTH FLOOR                    |             |                      | ART UNIT            | PAPER NUMBER     |
| LOS ANGELES, CA 90025-1030       |             |                      | 2883                |                  |

DATE MAILED: 05/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Ak

|                              |                        |                     |  |
|------------------------------|------------------------|---------------------|--|
| <b>Office Action Summary</b> | <b>Application No.</b> | <b>Applicant(s)</b> |  |
|                              | 10/666,482             | YAMADA ET AL.       |  |
|                              | <b>Examiner</b>        | <b>Art Unit</b>     |  |
|                              | Erin D. Chiem          | 2883                |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

**A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.**

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) Responsive to communication(s) filed on 18 September 2003.  
 2a) This action is FINAL.                    2b) This action is non-final.  
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) Claim(s) 1-15 is/are pending in the application.  
 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
 5) Claim(s) \_\_\_\_\_ is/are allowed.  
 6) Claim(s) 1-15 is/are rejected.  
 7) Claim(s) \_\_\_\_\_ is/are objected to.  
 8) Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) The specification is objected to by the Examiner.  
 10) The drawing(s) filed on \_\_\_\_\_ is/are: a) accepted or b) objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
 a) All    b) Some \* c) None of:  
 1. Certified copies of the priority documents have been received.  
 2. Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                                                                                         |                                                                             |
|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                                                    | Paper No(s)/Mail Date. _____.                                               |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>3/30/04 and 10/17/</u> . | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
|                                                                                                                                                         | 6) <input type="checkbox"/> Other: _____.                                   |

## **DETAILED ACTION**

This office action is in response to Applicant's response to the requirement for restriction/election filed on April 15, 2005. Applicant elected Invention I, drawn to claims 1-15. However, Applicant did not express the desire to traverse or not to traverse the restriction, nor did the Applicant presented an argument; thereby, the Examiner will proceed to prosecute the Applicant's elected claims 1-15 without traverse.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5, 8, 10, 13, and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Cho et al. (US 6,396,984 B1). Cho et al. teaches a mode shape converter comprising an under cladding (Fig. 3, 302) having a flat shape as a whole formed on a silicon substrate (Fig. 3; 300; col. 7, line 26), a first core 304 with a quadrangular cross section placed on the under cladding, a second core 308 placed on a terminal end portion of the first core, and an over cladding 310 placed in a region including the terminal end portion of the first core and second core placed on the terminal end portion of the first core. The under cladding and first core placed thereon constituted a first optical waveguide. The over cladding and the second core form the second optical waveguide. The mode field size conversion portion 314 is constituted by the region inclusive of the under cladding, first core and second, where the two sections overlap, and the

Art Unit: 2883

over cladding on and around the second core. The cross section of the two cores differs (Fig. 5a and 5b) and the first core is made of silicon through a dry-etching process (col. 7, line 39).

5. Regarding claim 5, as taught in the incorporated prior art, the second core is made of a material higher in refractive index than the than that under cladding and lower in refractive index than silicon of the first core of the terminal end portion (col. 2, line 24 –46). Furthermore, the Examiner respectfully point out the limitations that describe the differences of refractive index between the core and the cladding is a fundamental concept of confining light within the waveguide such that the light or optical signal can coherently propagate along the guiding path. Also, having the first core material higher in refractive index than the second core such that coupling to external sources is possible, since external sources such as an input fiber may have mode field diameters larger or smaller.

***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 6, 7 and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cho et al. in view of Zhou et al. (US 2003/0044118 A1).

8. Cho et al. teach a mode shape converter comprising an under cladding (Fig. 3, 302) having a flat shape as a whole formed on a silicon substrate (Fig. 3; 300; col. 7, line 26), a first core 304 with a quadrangular cross section placed on the under cladding, a second core 308 placed on a terminal end portion of the first core, and an over cladding 310 placed in a region

including the terminal end portion of the first core and second core placed on the terminal end portion of the first core. The under cladding and first core placed thereon constituted a first optical waveguide. The over cladding and the second core form the second optical waveguide. The mode field size conversion portion 314 is constituted by the region inclusive of the under cladding, first core and second, where the two sections overlap, and the over cladding on and around the second core. The cross section of the two cores differs (Fig. 5a and 5b) and the first core is made of silicon through a dry-etching process (col. 7, line 39). However, Cho et al. do not explicitly teach covering the first and second core and the side portion with a silicon oxide film.

9. Zhou et al. teach a silicon waveguide layer may be bonded on top of an X-SiO<sub>2</sub> structure and the X element may be a dielectric thin film [0421] for the purpose of fabricating very thin planar waveguide as taught by Zhou et al. Furthermore, this method can be used to manufacture the cladding for the purpose of easily varying the refractive index for specific application purpose.

10. Since Cho et al. and Zhou et al. are both from the same field of endeavor, the purpose disclosed by Zhou et al. would have been recognized in the pertinent art of Cho et al.

11. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to cover the core with the material having the same refractive index such as the method taught by Zhou et al. for the purpose of efficiently coupling light from the first core to the second core.

12. Claim 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Cho et al. in view of Zhou et al.

Art Unit: 2883

13. Cho et al. teach a mode shape converter comprising an under cladding (Fig. 3, 302) having a flat shape as a whole formed on a silicon substrate (Fig. 3; 300; col. 7, line 26), a first core 304 with a quadrangular cross section placed on the under cladding, a second core 308 placed on a terminal end portion of the first core, and an over cladding 310 placed in a region including the terminal end portion of the first core and second core placed on the terminal end portion of the first core. The under cladding and first core placed thereon constituted a first optical waveguide. The over cladding and the second core form the second optical waveguide. The mode field size conversion portion 314 is constituted by the region inclusive of the under cladding, first core and second, where the two sections overlap, and the over cladding on and around the second core. The cross section of the two cores differs (Fig. 5a and 5b) and the first core is made of silicon through a dry-etching process (col. 7, line 39). However, Cho et al. do not explicitly teach the refractive index of said over cladding is higher than the refractive index of the under cladding. Nor do Cho et al. teach the refractive index difference between the second core and the under clad is larger than that between the second core and over cladding.

14. Zhou et al. teach the refractive index of said over cladding is higher than the refractive index of the under cladding, and further teach the refractive index difference between the second core and the under clad is larger than that between the second core and over cladding [0188]. The purpose of Zhou et al.'s teaching is for the device that perform as a one dimensional beam-size enlarging element in the vertical direction for a propagating optical beam and can enlarge an optical beam from a semiconductor waveguide with a beam size as small as  $\lambda/7.5$  to a beam that is five times larger [0183].

Art Unit: 2883

15. Since Cho et al. and Zhou et al. are both from the same field of endeavor, the purpose disclosed by Zhou et al. would have been recognized in the pertinent art of Cho et al.

16. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to predetermine the difference in refractive indices of the core and the claddings for the tailoring of the device to enlarge mode size.

17. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cho et al. in view of Zhou et al.

18. Cho et al. teach a mode shape converter comprising an under cladding (Fig. 3, 302) having a flat shape as a whole formed on a silicon substrate (Fig. 3; 300; col. 7, line 26), a first core 304 with a quadrangular cross section placed on the under cladding, a second core 308 placed on a terminal end portion of the first core, and an over cladding 310 placed in a region including the terminal end portion of the first core and second core placed on the terminal end portion of the first core. The under cladding and first core placed thereon constituted a first optical waveguide. The over cladding and the second core form the second optical waveguide. The mode field size conversion portion 314 is constituted by the region inclusive of the under cladding, first core and second, where the two sections overlap, and the over cladding on and around the second core. The cross section of the two cores differs (Fig. 5a and 5b) and the first core is made of silicon through a dry-etching process (col. 7, line 39). However Cho et al. do not teach a second over cladding is placed on said over cladding placed on the core of the first optical waveguide and second core of second optical waveguide continuous with over cladding and second over cladding is lower in refractive index than the second core.

19. In claim 54, Zhou et al. claim such limitation for the purpose of providing further confinement of the optical signal and to protect the over cladding from environmental damages.

20. Since Cho et al. and Zhou et al. are both from the same field of endeavor, the purpose disclosed by Zhou et al. would have been recognized in the pertinent art of Cho et al.

21. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to provide an over cladding over the preexisting cladding as a precaution from environment damage and further confining the beam since the fabrication of the such waveguide device only further require a deposition of another thin film of silicon oxide.

*Conclusion*

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. As disclosed in the IDS, two most relevant arts are the Pre-Grant Publication of Park et al., teaching coupling of tapered waveguides for mode conversion, and Yoshimoto published paper the Applied Optics journal, teaching the fundaments of tapered waveguides for mode conversion. Furthermore, the non-patent literature documents applied in combination renders the current application to not be in allowable condition.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erin D. Chiem whose telephone number is (571) 272-3102. The examiner can normally be reached on Monday - Thursday 9AM - 5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frank G. Font can be reached on (571) 272-2415. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2883

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erin D Chiem  
Examiner  
Art Unit 2883

Frank G. Font  
Supervisory Primary Examiner  
Technology Center 2800